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ABSTRACT

This publication was prepared to assist Federal, regional, state, and local administrators of post-secondary programs to prepare technicians for environmental control and related fields. Administrative concerns discussed in the guide include: (1) identifying a technological field and determining the need for a 2-year training program, (2) utilizing an advisory committee, (3) developing a curriculum, (4) determining facility and equipment requirements, (5) selecting the staff, (6) financing the program, (7) organizing a cooperative work program, (8) providing student personnel services, (9) organizing a placement service and provisions for followup of graduates, and (10) providing short, specialized programs. An example of factors considered and actions taken in initiating a water conservation program, a listing of scientific and technical societies, and a bibliography are also provided. (SB)

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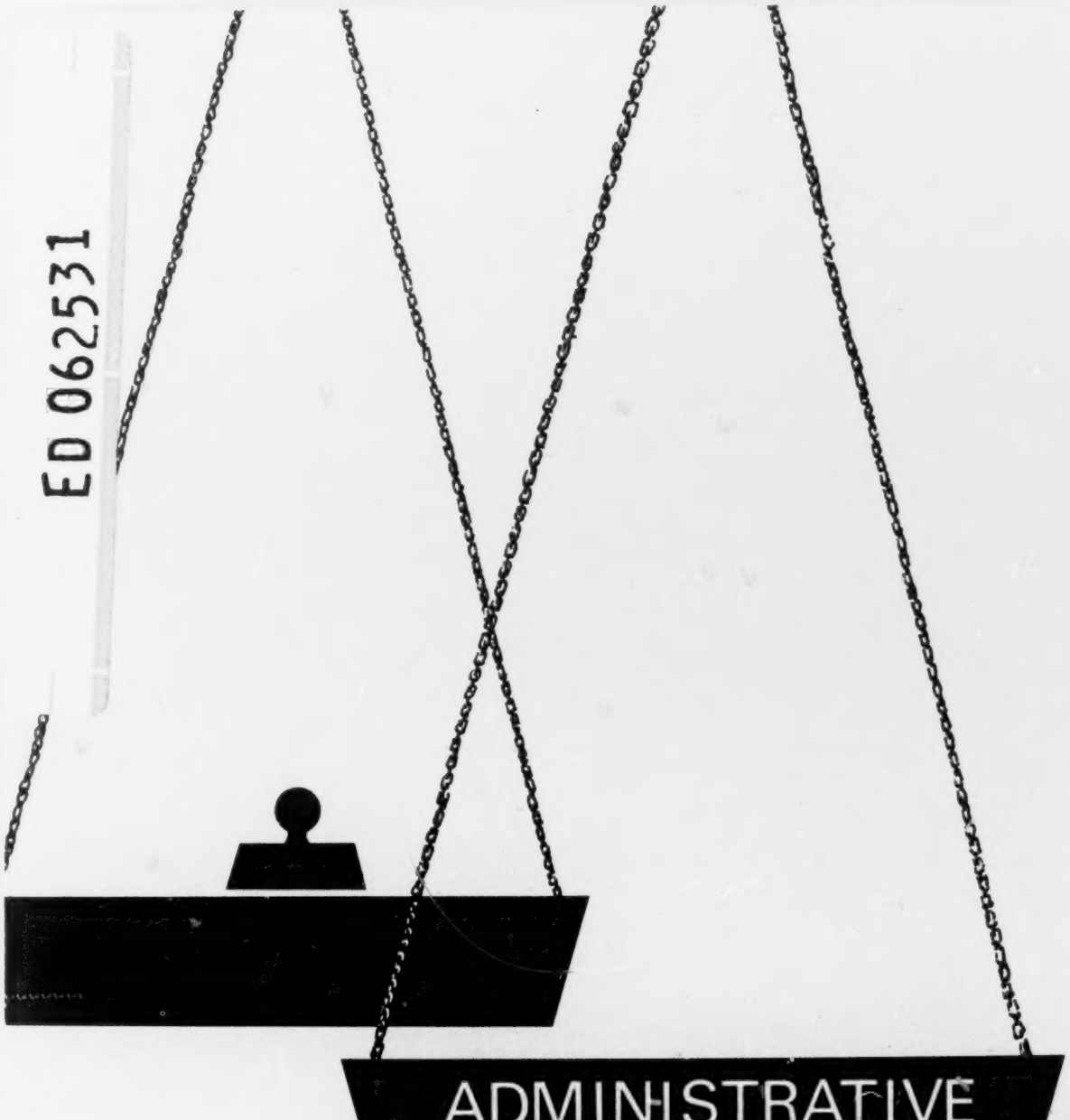

ADMINISTRATIVE FACTORS & ACTIONS

IN INITIATING POST-HIGH SCHOOL

ENVIRONMENTAL CONTROL TECHNOLOGY PROGRAMS

□ A SUGGESTED GUIDE □

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ADMINISTRATIVE FACTORS AND ACTIONS IN INITIATING TWO-YEAR POST HIGH SCHOOL ENVIRONMENTAL CONTROL TECHNOLOGY PROGRAMS

A SUGGESTED GUIDE

BY ALBERT V. PAYNE

MOHAWK VALLEY COMMUNITY COLLEGE
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PREFACE

Late in 1970, the U.S. Office of Education, Bureau of Adult, Vocational and Technical Education, Division of Vocational Education, awarded a contract for the purpose of developing a suggested guide for administrators of two-year post-high school educational institutions who wished to develop programs in environmental control technology.

This publication was prepared to assist Federal, Regional, State and local administrators of programs to prepare technicians for environmental control and related fields. It is also designed to assist those who serve on advisory committees, evaluate programs, employ technicians, or interpret programs to parents or other members of the public-at-large. It deals with several important aspects of administration of post-high programs to prepare technicians and similar technical assistants, and is intended to reflect past experience to those considering the initiation of new programs or revision of existing ones in environmental or related fields.

In the preparation of the guide, an attempt has been made to maintain brevity and to deal only with those elements that are essential in the design and operation of a good technology program.

A great many technician educators, employers, and other persons who are aware of the need to create a supply of manpower capable of dealing with problems of environmental control have contributed to the development of the guide. In putting it into its final form all suggestions for content were considered always, however, with the planned format and the purpose of the guide very much in mind. Not all of the suggestions that were offered could, therefore, be incorporated. For this reason it should be recognized that the guide may not receive the complete endorsement of all those persons who have contributed to it.

A list of people who made some form of contribution is included at the end of the document. Thanks are due all of them for their interest and the valuable help they gave. A special expression of appreciation is due Dr. Walter J. Brooking of the U.S. Office of Education for his suggestions regarding the content of the guide and for the help he was able to provide throughout the project.

Albert V. Payne, Project Coordinator

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INTRODUCTION

American Society and its institutions are being made increasingly conscious of the environmental problems that have been growing in consequence with the rapid growth of the means and products of technology and the habits of affluent consumers. We recognize now that without immediate corrective action, the health and welfare of the nation will be seriously threatened. Some of the actions and programs needed have been planned and suggested for many years, but the impetus to get them funded has been too weak. Now this is changed, and our society is involved in major activities planned to solve some of our pollution and waste disposal problems.

To make these plans on a national scale requires, among other things, a concerted effort in education on all levels. A process of educating the public at large is being carried on in schools and mass media by a variety of agencies and groups. The general public is being urged to assume an active role in bringing about a better control over our environment.

Government and private agencies are emphasizing the need to spend billions of dollars in the years ahead to correct existing conditions in the air, and in the lakes and rivers of the nation. The success of the resulting programs will depend in large measure on the availability of thoroughly trained, technical personnel to do the essential research, to make the plans, and to carry them out. Much of this training will be in two-year post secondary school technician programs.

The growth of the community college movement in our country has been so rapid that it has been extremely difficult for experienced two-year colleges to share their know-how in a helpful way with some of the newer institutions involved in the investigation of educational needs, and curriculum development and operation to meet those needs. The result has been that many clearly needed programs have either not been developed or, if started, have failed in one way or another because of the lack of experience on the part of planners and organizers.

It is the purpose of what follows to identify the assumptions, parameters of assessment and procedures involved in the study and development of post-high school two-year environmental control technology programs. The order of chapters is arranged to be particularly useful to the two-year college administrator and his staff who must organize time, money, and personnel in an attempt to decide upon the implementation of any program. The matters considered have been selected on the basis of many years of study and responsibility.

The future of the American way of life depends in great measure on the skills and maturity of the technicians produced by the two-year colleges. What is done for them in the colleges, therefore, is crucial for all of us.

When Harold D. Dodds retired from his position as President of Princeton University, he received a grant from Carnegie Corporation that finally resulted in a book entitled "The Academic President—Educator or Caretaker?" The following quotation from this book was written under the heading "Educational Leadership, the President's Prime Function." "Instead of devoting himself chiefly to secondary activities, we believe that the president must preserve his educational leadership, that it must indeed be enhanced. . . He reveals where his heart lies and sets the character of his administration by the choice he makes between those functions to which he gives his most personal, intimate, and continuing attention and those which he more generally leaves to others. We believe that implicit in the office he holds is the duty to participate actively in framing and carrying out the teaching and scholarly policies of his institution."

Throughout this guide the suggestion is repeatedly made that the head of the institution developing a new environmental control technology program must provide active leadership in planning the program and in developing the resources that will be needed for its successful operation. The vigor of any educational institution is, or ought to be, most noticeable in its concern with students and programs. The intense concern of the person in the highest office of the two-year college is crucial in the establishment and maintenance of worthwhile curricula.

The title of this guide makes clear that it is intended to serve the needs of institutions offering two-year post high school technology programs. Most of these institutions operate under the name "junior college" or "technical institute" or "community college" or a division of a four-year college or university. Regardless of name, they all offer a substantial amount of college-level work. For purposes of simplicity, the term "college" is, therefore, used when reference is made to this type of institution.

1. How to Identify a Technological Field and Determine the Potential Need for a Two-Year Program

Identifying a Technology Field

A field of technology in which technicians who are graduates of a two-year college program may be employed can usually be identified by the following means. Wherever a large number of specialized professionals are employed there is a probability that technicians will be needed in supportive roles. Studies have shown that the ratio of technicians to engineers should be in the order of two or three technicians to one engineer.

Professional specialists tend to organize themselves mainly for the purpose of improving communication. The existence of a scientific or technical society with a substantial membership and publications that deal with a range of topics within a particular branch of applied science is indicative of the fact that the specialization the society promotes is broad enough to justify the training of technicians in a two-year program. Within the fields of engineering there are specialties that include:

Aeronautical and Aerospace
Air Conditioning
Civil and Construction
Chemical
Electrical and Electronic
Electro-Mechanical
Mechanical Metallurgical

Other fields of technology such as biological science and agricultural technology, are also divided into a similar range of specializations. In all of them technicians find opportunities for creative and satisfactory employment. All of the above technological specialities are well established and, therefore, not hard to identify. It is much harder to identify one that is new. Failure to do so, however, could place a considerable handicap on the development of a new field such as environmental control.

At a conference of two-year college educators with an interest in the field of environmental control, it was concluded that all job areas at the technician level could be grouped under four clusters tentatively titled:

1. Pollution prevention and control
2. Disease prevention (non-patient care)
3. Environment planning
4. Resources control

As can be expected, there are instances of overlap and similarity between the clusters, but these four clusters serve the purpose of differentiation and categorization.

Within these clusters a number of technical specialities to which the two-year college student may aspire are evident or emerging. These specialities could include, but not be limited to, the following:

Air pollution control
Water conservation and pollution control
Noise pollution control
Solid waste storage, collection and disposal
Sewage waste collection and wastewater treatment
Public health control
Milk and food sanitation
Occupational health and industrial hygiene
Institutional sanitation
Radiological health and safety
Park and recreation area planning
Urban and rural environment planning
Forest, wildlife and soil conservation
Pesticide control
Marine life technology
Agricultural chemical application
Ornamental architecture

These specialities are linked closely with many academic disciplines already existing in two-year colleges. The curricular fields of agriculture, health, engineering technology, natural science, and social science serve as the base for many of the above, while still others are based on an inter-disciplinary approach in program design.

Not included in the above list of specialities are programs that already exist in the two-year colleges which prepare students for employment in industries which very often affect conditions within the environment. In the past, chemical processes which were designed without regard to their effect on environment have contributed to pollution. Highways and other structures have too often been built without thought about their effect on the ecology of an area. Existing programs that prepare graduates to work in fields that could affect environmental conditions should be re-

examined and modified where necessary to make students aware of the possibilities for improvement of the environment in the work they may be doing.

It is extremely important that the college administrator be constantly alert to the possible need for new kinds of programs his college has the capability to develop; and thereby, to meet the demand for technical manpower in the community his college serves. He can maintain this state of alertness by keeping abreast of the developments taking place in technology through his reading, and by maintaining contact with individuals and organizations involved in new industries. If the administrator demonstrates a willingness to explore possibilities for the development of new programs to meet new needs, he will find that he is on a two-way street; people will be coming to him with requests for new programs. He will then find it possible to initiate discussions about the nature of the technology which new programs will involve.

Determining The Need

Before initiating any academic programs in the field of environmental control technology or other fields, a two-year college should conduct an extensive investigation to justify the advisability and feasibility of implementing such programs. Traditionally, the basis for introducing an occupationally oriented course of study has been one of filling manpower needs within a limited geographical area. The optimal approach has been to design and introduce a course of study in which the number of students satisfactorily completing the program and readily available for immediate employment in the given occupation would match the present and predicted employment opportunities within the specified geographical area. Since the demand for the graduates for some specialities in environmental control technology may not be very great for some time to come, the college may have to plan to serve a larger geographical area than it normally does. *If the college is a unit of a State system of two-year colleges, it may be necessary for the college to obtain an agreement at the State level to avoid duplication of the effort and expense in other colleges and to insure the fact that the program can be maintained as a viable one.*

An estimate of the number of job openings and positions which will occur over a period of time can usually be readily ascertained from the frequently published statistical indexes. National, regional and in many cases local, studies of manpower needs and trends are primary sources. Generally, the information available relates to new positions and replacements through normal turnover of personnel through death, retirements, or change of position. This information can be used in established titles in the field, such as

park managers, public health inspectors, sewage plant operators, forest conservation officers, etc., but employment opportunities in emerging occupations are not as easily discernible, particularly for the more distant future.

A commonly used method of determining the need for a new educational program is a direct canvass of potential employers in the geographical area to be served. A questionnaire requesting information pertinent to the program under study is an often used beginning for this activity. The college should make clear that the sole purpose of the questionnaire is to obtain information on which to base a decision to offer or not to offer a program of study, and that the college is not making a commitment at this point to go beyond obtaining this information.

The questionnaire should be designed to elicit information of the following nature:

The types of positions available
The number of past, present and future employees
The opportunities for promotion
The prerequisites for employment positions
The characteristics sought in potential employees
The pay scale for initial employment
A description of duties to be performed

The danger that exists when a questionnaire of this sort is used is that the person who responds to it may not be aware of the future plans of his organization, and therefore not be able to provide accurate information about the number of positions that may be available at some time in the future.

Past experience has also shown that the attitude of employers about the future is affected by the state of the economy at the time information is elicited from them. If the economy is expanding, they tend to be over optimistic and, if it is contracting, unduly pessimistic.

Even when there appears to be a very real need for technicians, internal conditions within an organization may make satisfactory employment impossible. These conditions might exist because of labor union contracts or even the attitude of existing employees towards the use of technicians.

In most situations, the most effective way to determine the need for a two-year technology program is through the use of an ad hoc advisory committee composed of interested and informed professionals. These people, sitting down together, have an opportunity to check the accuracy of their individual opinions against the opinions of others and also to provide the administrator with insights he would not be able to obtain through the use of a questionnaire. The advisory committee is such a crucial part of the process that its operation is described in detail next.

2. Advisory Committee

Those responsible for developing a new curriculum to train technicians need two kinds of information initially. First, they need to know the trend of job opportunities in the specific field of activity they are attempting to serve: is it upward, stable, or decreasing? In particular, they need to know about the job opportunities that might exist for the kind of graduate the new curriculum will produce: what are the opportunities for entry jobs and what are the opportunities for later promotion into positions of greater responsibility with higher pay?

The other kind of information involves the elements of skill and knowledge the technician must have in order to perform successfully in the field for which he is being prepared.

There are a number of ways in which this information can be obtained as described in the previous section, but for the purposes of a single institution attempting to develop a new curriculum, the most direct and reliable is via an advisory committee.

The people best able to provide the first kind of information are those involved in long-range planning in organizations likely to employ graduates of the program being developed. This means that they are likely to be fairly high-level executives. Fortunately, for educators, they are usually easy to identify and recruit for an advisory committee.

Information about the work graduates will be doing, and the training they will need, can best be obtained from people who are presently planning and supervising this kind of work. They can often be identified and recruited with the help of the executive element on the advisory committee.

Before the administration can decide whether to recommend the introduction of the new curriculum, it will need information about the laboratory and classroom facilities required to support the program and the availability of qualified instructors. The advisory committee will also be able to provide much of this information.

By going through the process of developing a new technology program with the aid of an advisory committee the college will create an invaluable resource in the form of a group of interested and informed citizens who can be called on for help in a number of ways beyond those listed above.

Since the advisory committee will be a working committee, it should be composed only of people who can make a direct contribution and limited to a size that makes possible active participation by all members.

In order to give the advisory committee the standing it ought to have, appointments should be made by the chief administrative officer of the college with the approval of the governing board.

The first meetings of the advisory committee will be for purposes of orientation. The administration will want to become knowledgeable about the occupational field it is attempting to serve and at the same time inform the members of the committee about the philosophy and objectives of the college. The college must, therefore, be represented at these meetings hy persons who are at the highest level of administration. If possible, both the chief executive officer and the academic dean should be present.

To help the committee members think about the ways in which technician graduates may be employed, and the numbers that may find employment, the educators should explain what a technician is and the nature of educational programs designed to train technicians. The definition of "technician" can best be expressed in terms of the knowledge and skills he must possess in order to perform his function. The following is adapted from a U.S. Office of Education bulletin. *Criteria For Technician Education* Superintendent of Documents, Catalog No. FS 5280: 80056

1. Proficiency in the application of basic principles from the physical, biological and social sciences pertinent to the individual's field of technology.
2. Thorough understanding and facility in the use of the materials, processes, apparatus, procedures, equipment, methods, and techniques commonly used to perform the specialized services required of the technology.
3. A degree of competence and depth of understanding sufficient to establish effective rapport with associates; to enable him to do detailed scientific or technical work as outlined in general procedures or instructions; and to exercise individual judgment, initiative and resourcefulness in the use of techniques within the range of information that may be available to him.
4. Communication skills that include the ability to record, analyze, and transmit facts and ideas by the means in common use in his area of specialization.

The above definition should be expanded and clarified through discussion of the technical programs that may already exist in the college and the manner in which the graduates from these programs perform as employees.

Since the field of environmental control is a newly developing one, very little insight into the future demand for environmental control technicians can be obtained by any kind of formal

survey of existing employment opportunities. The most reliable information will be the estimates made by the advisory committees. This information should be supplemented through the reading of material on the subject published in professional journals, by making direct contact with people who, because of their professional activities, have become aware of manpower needs, and by information that may be obtained from professional and technical societies and government agencies. As an aid to the college administration carrying out this exploratory step, a list of societies and government agencies has been included in this guide.

When the preliminary investigation of manpower needs has been completed, the administration will have to decide whether to proceed with the next step, which is the development of a curriculum. If the study shows a probable need for thirty or more graduates a year for a period of several years in the geographic area served by the college, a decision in favor of taking the next step would appear proper. If the demand is likely to be less than this, the administration will have to justify further action on the basis of answers to the following questions:

1. Will the introduction of the new technology program tend to strengthen programs already existing in the college?
2. To what extent can existing facilities be used for the purpose of the program?
3. If such facilities are not available, what is likely to be the cost of new facilities?
4. Is there substantial evidence that the demand for graduates will increase within four to five years?
5. Is the need for manpower so critical that a high cost for preparing even a few technicians can be justified.

Time Required to Initiate and Establish a Two-Year Technology Program

If a college introduces a technology program that has been in operation in other colleges for a period of several years, it can obtain the benefit of experience the other colleges have had and thereby save a great deal of time and effort. When a college is making a pioneering effort and developing an entirely new program the administrator should expect that two to three years will be needed to gather information about employer and student interest, develop a new curriculum, plan and acquire facilities, and obtain a competent teaching staff. It will take two more years to graduate the first group of students and begin an evaluation of the

program based on the experience employers have had with graduates. *This means that to introduce a new program and to refine it through a process of evaluation will take a minimum of five years.* This fact should be kept clearly in mind by a college administrator who is considering the possibility of introducing a new program.

3. Developing The Curriculum

Before attempting to describe a process of curriculum development involving the use of an advisory committee, it might be well to discuss other methods that are in common use. One method is to obtain the services of a practitioner who has had experience with the technology, appoint him to the position of department head, and make him solely responsible for the development of the curriculum. *When this method is used there is a danger that the ultimate result will reflect a personal experience which may be limited and lack awareness of recent developments in the technology.* When an administrator appoints a person to the position of department head he makes a partial commitment to the introduction of the program and creates a certain degree of pressure to follow through even though evidence obtained later may raise doubts about the advisability of doing so.

Another method is to assign the responsibility for the development of a curriculum to a faculty committee composed of people who are knowledgeable in areas related to the technology. When this happens the curriculum may be developed almost exclusively on the basis of the interests of the committee members. In some educational situations this may be quite satisfactory, but usually it is not when the curriculum is being designed to train technicians in an entirely new field.

In developing a curriculum in environmental control technology, the college will probably be making a pioneering effort that will require the help of both faculty members and persons from outside the college who are working in the technology area. The administrator should, therefore, create a task force composed of the dean and two or three faculty members who have had experience in curriculum development and who may also have knowledge of the sciences involved in the technology. This task force should be given the responsibility for developing the curriculum in cooperation with the advisory committee and for using whatever additional resources may be available.

Working with an advisory committee in order to develop a curriculum requires a considerable amount of skill. The administration must, therefore, select the members of the task force with great care. In the meetings with the members of the advisory committee the task force must seek to obtain an understanding of what basic principles of science are applied, what knowledge of materials, processes, apparatus, procedures and techniques are needed, and the way in which the technician's activities may be related to the activities of other employees. This search should go

beyond what is needed by the technician to obtain an entry job; it should also attempt to determine the knowledge and skills he must have to become a candidate for advancement after he has obtained practical on-the-job experience. It may not always be possible to meet these latter needs in a two-year curriculum. Course material included in the curriculum should therefore be designed so that graduates are prepared to take courses beyond those the two-year program can provide if they so desire. This means that emphasis should be placed on understanding of and use of basic principles rather than skill in the use of hardware alone.

In designing a curriculum to attain the objectives developed in consultation with an advisory committee, the task force will have to consider:

1. The kind of learning experiences that are needed to support the objectives of the program.
2. The proper sequence of learning activities.
3. The amount and nature of general education.
4. The means by which general education, including language and communication, basic sciences, mathematics, and social sciences; and the technical specialty component can be related.
5. The nature and extent of laboratory and clinical experiences.
6. The blending of laboratory and clinical experiences with classroom experiences.

Designing a curriculum is an empirical process. The product of this initial effort must, therefore, be subject to constant review and change.

On the basis of what might be considered a first approximation, the administrator can determine the facilities that will be needed to support the program and the number and kind of instructors whose services will have to be obtained. From this he can derive an estimate of the cost of establishing and operating the program.

4. Facilities

Classroom and General Facilities

Classrooms and lecture demonstration rooms should be equipped with teaching aids and demonstration equipment that are appropriate for a technician program. This does not mean that the college should adopt traditional arrangements used in this type of facility. A great many interesting possibilities now exist for the creating of facilities that provide flexibility in the way they may be used, and opportunities for imaginative approaches to instruction.

All teaching staff members should be provided with office space that is adequate in size, well lighted and furnished. Offices should provide sufficient privacy so that instructors can work and confer with individual students. For instructors who teach science or technical-speciality laboratory courses, space should be provided that is equipped with all the necessary utilities to test procedures or equipment that may later be used by students.

In some technology programs, it may be desirable for students to obtain clinical experiences outside of the college. These experiences should not, however, be used as a complete substitute for well planned laboratory experiences that are under the direct supervision of an instructor.

Laboratories and Equipment

The principal reasons for providing technical students with laboratory experiences is to give them an opportunity to apply the scientific principles they have been studying in order to increase their understanding of these principles and to help them acquire the skill and confidence they need to perform successfully when using scientific equipment in their work as technicians.

It is this emphasis on skill in the use of fairly sophisticated equipment that represents one of the major differences between education at the technician level and engineering education. The technician, working as a member of a team composed of engineers, technicians and skilled craftsmen – an arrangement that exists in many industries – is the person who will probably be responsible for the care and operation of any scientific equipment used by the team. *He should, therefore, be given an opportunity to have "hands-on" experiences almost from the beginning of and continuing throughout his two years of education.*

Equipment

Laboratory facilities and equipment are the major elements of cost in a technician education program. Not only does the initial cost tend to be high, but the constant use of the equipment by students usually results in high maintenance costs also.

In selecting laboratory equipment, the college should keep in mind the fact that what is being taught are fundamental principles and basic techniques. The equipment that is selected should, therefore, be that which best serves these purposes. A "black box" that is so completely enclosed that students cannot examine internal elements has little value for purposes of instruction. Fortunately, a number of companies produce a variety of demonstrators and simulators for teaching concepts and principles of operation in such a way that students can see what is happening and, therefore, better understand. This type of apparatus should not, however, be used as a complete substitute for the real thing. Students should also be given an opportunity to apply the principles they have learned through use of standard equipment.

It will be impossible for the college to keep purchasing the latest designs of equipments that manufacturers produce, but if emphasis is placed on an understanding of underlying principles of operation rather than the way a piece of "hard-ware" is operated, a graduate will be able readily to learn to operate a new piece of equipment he may not be familiar with.

Selection of equipment is one of the time consuming activities connected with the development of a new technology program. In addition to making the investigations which lead to the selection of equipment, there usually has to be extensive correspondence with manufacturers regarding specifications and prices.

The selection of equipment should be made by faculty members who will be responsible for its use, but only after the objectives of the program have been clearly defined and a fair amount of course development work completed. Mistakes in the selection of equipment can be costly not only in terms of money that may be wasted, they can also cause damage to the program. When equipment is in place it is difficult to remove even when it is not suitable for instructional purposes. The administrator should, therefore, request some form of justification for the acquisition of all major items. A justification can best be expressed in terms of the way in which the equipment will be used and the extent of its use.

The help of an advisory committee can be of great value not only in selecting the proper equipment, but also in obtaining it

through an adequate appropriation of funds or through contributions made by the industries served by the program.

A program of study must be kept up-to-date not only through a constant re-examination of its content but also through the replacement of obsolete equipment. An administrator should keep this in mind when making long-term plans for the allocation of funds. He should be certain that money for the replacement of equipment is provided.

Items which are expensive and which tend to become obsolete in a fairly short period of time should, if possible, be leased or rented. Only on rare occasions can a two-year college justify the out-right purchase of electronic data processing equipment. It is usually much less costly to rent or lease it and replace it when newer models are developed. Some manufacturers of equipment are happy to make an arrangement for the use of their product at a reasonable cost to the college in order to ensure the fact that students, possible future users, will become familiar with it.

Space Planning

Architects who have had a considerable amount of experience in planning space requirements for technical programs in two-year colleges provide the following data as a guide for laboratory space planning:

Science Laboratories

	Net Area Sq. ft.
24 stations 50 sq. ft. per student	1200
Preparation and storage	420

Industrial Laboratories

	Net Area Sq. ft.
24 stations 50 sq. ft. per student	1200
Storage area	180

Library Facilities and Materials

Much of the time of a technician is spent in obtaining and studying information related to the work project he may be involved in. In additon to this he must keep abreast of changes that take place in the total area of his specialization through reading the literature that deals with these changes. A library learning resources center that has been well planned, staffed, and financed is an essential facility for the training of technicians. Both students and faculty can function better where such a facility exists. Faculty members have an opportunity to select from a variety of resources the materials best suited to meet individual and class needs, and students can develop their personal interests through independent study.

The widest possible variety of print and non-print materials that may serve the objectives of the new technician program should be made available within the library. These materials should be constantly under review by the library staff and the faculty so that obsolete materials will be eliminated and materials that deal with current developments in the students area of specialization added.

Emphasis of all library services should be on the individual learner, on facilitating inquiry, and on developing the ability to use the library resources independently. The library staff should assume the responsibility of showing students how to use the bibliographic services that are available and informing them about the availability of newly acquired materials. The teaching faculty should support this activity by encouraging students to use the library by relating its services to the instructional program.

One of the ways in which a new technology program can establish a relationship with the industry it is designed to serve is by becoming an information center for the industry. The industry should, therefore, be made aware of the library resources and encouraged to use them as much as possible.

5. Staff

Buildings and equipment are important in a technology program, but it is the staff that determines its quality. By staff is meant all those who are involved in the instructional program. They include department heads, instructors, laboratory assistants, counselors, coordinators and librarians. Without a thoroughly competent and dedicated staff, the program cannot accomplish its purpose. The college administration should be prepared to devote a great deal of time and effort to recruiting the best possible people and to providing them with the leadership and support they will need.

A key person in the development and later operation of a new technology program is the department head. He should be selected at least a year before students arrive on campus in order that he may participate with the dean and the members of the advisory committee in making many of the decisions that will have to be made relating to the curriculum, laboratory facilities and the selection of instructors.

Ideally, a department head should have had an educational experience which has given him an understanding of the scientific principles underlying each part of a technology program, and a familiarity with the equipment and techniques used in the practice of the technology. Usually this experience is obtained in a professional school such as engineering, agricultural or medical. In addition to this, he should have had employment experience in the technology area preferably at an administrative level that is sufficiently recent to make him familiar with current practice. Finally he should have had teaching experience in either a two-year or four-year college.

People with this kind of background are extremely difficult to find, particularly when the program is in such a new field as environmental control. If a choice has to be made between a person who has had excellent industrial experience but little teaching experience and a person whose background represents the reverse, a decision should be made in favor of the person with industrial experience. If this choice is made the dean will have to assume more responsibility than he might otherwise have to in helping the new department head adjust to a teaching situation.

There are very good reasons for making a decision in this way. A technology program is not likely to be successful unless it receives the support of the industry it serves. It is essential that the department head be able to establish and maintain industrial contacts which can provide help for the college in a variety of ways, and

industrial experience is particularly valuable here. The contributions industries can make include employment of graduates, providing co-operative work opportunities, assistance in organizing conferences and short courses for people already employed, donations of equipment, and scholarships for worthy students.

A person who may appear to be well qualified on the basis of teaching experience alone may have difficulty working with an advisory committee and may even tend to lose sight of the basic objectives of the program. The program could then move in a direction that was completely dependent on the teaching experience of the department head, and would not continue to reflect needs of future employers.

In order to provide the students with a breadth of view, a department should be staffed by a minimum of three persons, including the department head. The equivalent of at least two full-time instructors will also be needed to provide instruction in general education. In selecting faculty members for a department, the administrator should attempt to build a team that is balanced in such a way that the weakness of one person is off-set by appropriate strengths in the others. This balance should exist both in the area of subject matter, and between teaching and industrial experience. Particularly in the early days, when the new department is in the process of organizing itself, it should be the responsibility of the dean to work with the department head to weld the individuals within the department into a team through meetings that provide for a free exchange of ideas regarding objectives and the ways by which these objectives might be achieved.

One of the better paths of preparation for teaching faculty in technical specialties is graduation from a two-year technology program, suitable employment experience and continuous education to the baccalaureate level or beyond. This sort of preparation becomes increasingly important in view of the trend in professional schools toward greater emphasis on theory as preparation for careers in research and development rather than on applied technology.

A significant source of faculty is the college or university that requires a faculty member to have a doctorate in order to qualify for promotion from the rank of instructor. A number of instructors who for a variety of reasons may not obtain a doctorate may be excellent candidates for teaching positions in a two-year college.

If a decision is made to recruit instructors from industry, the advisory committee could help in establishing contacts with possible candidates and evaluating their competence.

There may be times when it is impossible to find instructors with all of the desired qualifications. In such cases, it may be

necessary to employ a person with a reasonably good background and to provide him with opportunities for professional development either by taking courses in another institution, or through practical experience obtained through summer employment in industry.

In order for a program which is limited to two years to be effective in attaining its objectives, it must be constructed and ordered with care. This means that the instructional program must be planned and co-ordinated through a joint effort on the part of the total instructional staff, including instructors in language and communication, science and mathematics, social sciences, and the technical specialty. All parts of the program should be designed to meet the actual needs of the students, and presented in such a way that students can appreciate the value of what they are studying. All too often instructors outside of the technical specialty decide in a rather arbitrary manner what these needs are and create unnecessary hurdles which students who may be potentially good technicians cannot get over. It is just as important for the English and the mathematics instructors to have an understanding of the demands that will be made on the graduate in their areas of specialization as it is for the instructors in the technical specialty.

The occupational hazard associated with the teaching of technical subjects is that an instructor will lose contact with new developments in his field of specialization and in a very few years – four or five at the most – be teaching subject matter that is obsolete. The administrator should, therefore, do all he can to encourage the instructional staff to engage in activities that provide them with opportunities to maintain an awareness of current developments in their field of specialization. One way is to have the college subsidize membership in scientific and technical societies and to make the facilities of the college available for chapter meetings. Usually local chapters of these societies are happy to have some form of affiliation with an educational institution. In fostering a relationship between the college and local chapters of professional societies, the college stands to gain a great deal. Both students and faculty have an opportunity to come into frequent contact with chapter members who are working in their field of specialization and through these contacts develop an understanding of the practical applications of the technology they are concerned with. The society members in turn can develop an understanding of the technician program in the college and help to solve some of the problems the college has constantly to deal with. Among them are the recruitment of interested and qualified students, financial support for students with limited means, and the placement of graduates in satisfactory employment.

Many technical societies sponsor and even subsidize student chapters. Where such chapters exist students have an opportunity to gain experience in professional activity and leadership that can be of considerable value to them when they become members of senior organizations.

The attendance by instructors at regional and national conferences of technical societies and organizations concerned with improving the quality of teaching should also be encouraged by the administration. This can be done by providing a departmental travel budget which can be used for faculty travel to such conferences.

Most industrialists are interested in providing help to a college that is training students for employment in their particular industry. In some cases this help has been in the form of short and intensive courses presented by employees of an industry to inform instructors about new processes, or the use of new equipment. The top administrator of the college may have to become active if this kind of help is to be obtained. Usually it comes as the result of a contact he makes with a person at a comparable level in industry.

Sabbatical leaves should be made available for instructors who wish to engage in an activity that will increase their ability to teach their specialty. When there appears to be interest, instructors whose subjects are not related directly to the technology should also be encouraged to obtain some form of industrial experience.

Consulting work outside of the college during the teaching year may provide instructors with opportunities to keep up to date in their technical fields. The danger is that their work load will become so great that the quality of teaching suffers. Furthermore, the college may be seen as subsidizing direct competition with professional consultants by making office and laboratory facilities available to instructors. Where this type of activity is engaged in it should be under some degree of administrative surveillance and control.

In a two-year college, where the major emphasis is on quality of instruction, a large part of an administrator's time should be devoted to the development of policies and practices that will result in the professional development of the staff.

Much of what the head of a college does is unseen and therefore unknown to all but those immediately around him. In working to assist faculty members to improve their performance and, therefore, their satisfaction in their work, he is providing leadership that is clearly evident to everyone, with consequences that are of tremendous benefit to him and his institution.

6. Financing The Program

Before a decision to introduce an environmental control technology program can be made, the administrator and those who are directly responsible for the decision must have a reasonably accurate estimate of the initial capital that will be required. They must also know what the annual operating costs will be for the first year and for later years when enrollment reaches a maximum.

The first step in determining capital costs is to establish initial and maximum enrollments. In doing this there are three factors which must be taken into consideration. The first of these is the employer demand for graduates of the program. If the demand is likely to be limited, enrollments should be limited. The second factor is the experience the college has had in enrolling students into technical programs. If the college has had difficulty in recruiting students into technical programs in the past, it is likely to have difficulty enrolling students into a new one. Finally, even if the demand for graduates is likely to be quite great and the number of students applying for admission large, the college may have a policy that limits the size of enrollments in any single program it may offer.

When these factors have been considered, it will be possible to establish enrollment figures for the purpose of determining facility and manpower requirements and eventually capital and operating costs.

A number of two-year colleges that have had several years of experience in planning, use the following data to estimate their needs in connection with technical programs:

Space Utilization Guides

Instructor's teaching load	15 hrs/week
Department head teaching load	6 hrs/week
Contact hrs/student/week	
Classroom hours	15
Laboratory hours	9
	24

Faculty/steno ratio (exclusive of Department Head) 7.5:1

Space Utilization Per Week Based on 45 Hour Week of Operation

Room utilization, hours per week	
Classroom – 60 students or less	30 hours
Classroom – 60-120 students	20 "
Laboratories and special purpose areas	24 "
Station utilization (when occupied)	
Classrooms	80% minimum
Other spaces	80%

Space Planning Guides

Classrooms	
20 stations	18 sq. ft./student
30 stations	16 sq. ft./student
40 stations	16 sq. ft./student
60 stations	16 sq. ft./student
Lecture Halls	
120 stations	12 sq. ft./student
240 stations	12 sq. ft./student
480 stations	10 sq. ft./student
Science Laboratories	
24 stations	50 sq. ft./student
Preparation and storage	450 sq. ft.
Industrial Laboratories	
24 stations	50 sq. ft./student
Storage area	180 sq. ft.

Office Space For full-time personnel only.

Department Head (Single occupancy)	180 sq. ft.
Faculty members (Double occupancy)	240 sq. ft.
One or two secretaries in office	120 sq. ft. each
Three or more secretaries in one area	80 sq. ft. each

In order that enrollment figures may be useful for purposes of planning they must be broken down into the number of classes and the size of each class. By using the above data it will then be possible to determine the number of classrooms that will be needed and the size of the classrooms. Architects who have had experience in building college facilities usually have available the cost per square foot of the type of classroom space that will be needed in the area where the facility is to be constructed and can also indicate on a percentage basis the amount of additional space that will be needed for such areas as corridors and storage facilities. Multiplying the square footage of total space by the unit cost will give the total cost.

Laboratory areas will have to be determined by a study of the curriculum. Basic science laboratories will probably already exist in the college and may be available for use in the new program. If they are not, the same process will have to be gone through to determine the number and size of science laboratory areas as was gone through to determine the classrooms that will be needed.

The curriculum will also have to be examined to establish the number and kind of laboratory areas that will be needed to teach the technical specialty. Before a decision is made to create new facilities existing laboratories that may have limited use in other curricula should be examined to determine whether they can be modified in order to serve a dual purpose.

Using the data regarding teaching loads, contact hours per student, and the number of classes, a determination can be made of the manpower needs for the new program. *As was pointed out earlier, at least three persons including the department head should be employed in the area of the technical specialty.* Knowing the salaries that will have to be paid, and the cost of fringe benefits that will have to be provided, it is possible to estimate the direct labor component of the cost of operation. The administrator will have to decide the nature of the other costs that should properly be charged to the cost of operating the program and obtain estimates of these costs from the business office of the college based on past experience in similar programs.

Sources of Financial Support

Most of the funds needed by two-year colleges for buildings and equipment are obtained through appropriations made by local and State governments if they are public, and through fund drives if they are private. In 1963, the Congress realized that the funds available from these sources would not be sufficient to provide all the facilities colleges would need to meet the growing demand for

higher education. The Higher Education Facilities Act of 1963 was the response. This act made funds available to support programs of construction of academic facilities on the campuses of both private and public institutions throughout the country. Under the provisions of the act each State was required to establish a commission for the purpose of receiving Federal funds made available through Congressional appropriations, and to control distribution of them. In order to obtain funds under the Higher Eudcation Facilities Act of 1963, a college has to make application to the commission in the State where the college is located.

Since 1963, the Higher Education Facilities Act has been amended to provide another form of financial support for the construction of academic facilities. Colleges that borrow money from private lending institutions for the purpose of constructing buildings may apply for grants to cover the cost of borrowing money at a rate of interest in excess of 3%.

The process of applying for funds is usually a long one. Colleges seeking such funds should become familiar with the process as soon as possible if funds are to be available when they are needed.

A copy of the Higher Education Facilities Act of 1963 as amended can be obtained from the office responsible for the general supervision of higher education in each State. Information about the method of preparing and submitting an application can also be obtained from this source.

Federal funds are also available for the support of new technology programs by the Vocational Education Amendments of 1968. These Amendments made possible the use of funds for post-secondary vocational programs for a variety of purposes, including the development of new curricula, the training of instructors, the preparation of instructional materials, the purchase of equipment and the construction of buildings. Each State is responsible for creating an agency to receive applications for funds and to make grants based on guidelines that may change from year to year depending on the changing needs within a State. The administrator should maintain contact with his State agency to determine the kind of program that would be considered for funding. The funds are administered by the State Director of Vocational Education who usually has an office in the State Capitol.

For several years the National Science Foundation has provided substantial support for new technology programs. An administrator who wishes to seek financial help in establishing a technology program in Environmental Control might apply to the N.S.F. Information regarding the way in which a request for funds should be submitted can be obtained by contacting N.S.F. and requesting their bulletin "Guide Lines for Proposals".

7. Possibilities For A Cooperative Work Program

Advantages of the Program

A student who is preparing himself to become a technician in the field of environmental control should have some of the experiences that can best be obtained through a program of cooperative work experience.

A very good definition of cooperative work experience is taken from a bulletin prepared by Henry H. Ormsby, formerly Chief of Engineering Education, United States Office of Education.

> "Basically the cooperative plan is defined as an integration of classroom work and practical industrial experience in an organized program under which students alternate periods of attendance at college with periods of employment in industry, business, or government. The employment constitutes a regular continuing and essential element in the educational process, and some minimum amount of employment and minimum standard of performance are included in the requirements for a degree."
>
> "The plan requires that the students' employment be related to some phase of the branch or field of study in which he is engaged, and that it be diversified in order to afford a spread of experiences. It requires further that his industrial work shall increase in difficulty and responsibility as he progresses through his college curriculum, and in general shall parallel as closely as possible his progress through the academic phases of his education."

The first program of cooperative education was established by Dean Herman Schneider at the University of Cincinnati in 1906. He established it because he found that graduates who did particularly well immediately after graduation had obtained some form of practical experience before they graduated.

Since the program was organized at the University of Cincinnati, many other colleges have established similar programs, some of them with outstanding success. It is, therefore, possible to weigh the advantages of such programs.

One reason for student failure, particularly in technical institutes, is lack of motivation. Many students who have the necessary basic intelligence to succeed in their studies fail because they do not see the relationship between their academic work and the work they will do when they graduate. Cooperative work provides the student with an opportunity to see this

relationship. The experience of many colleges that have co-operative work programs has been that students have a more mature attitude towards their academic work when they return to class after a period of work experience. This is true of their general education studies as well as their technical work.

Another advantage of cooperative work is that a student is given an opportunity to evaluate his ability in comparison with the requirements of the job. Many students are handicapped because they lack confidence in their own ability. Work experience gives them an opportunity to develop the kind of confidence which they need to succeed in their chosen field.

From the standpoint of the overall educational enterprise much can be gained from a cooperative work program because in a good one educators and employers must work together. Under these conditions the educator is kept aware of contemporary practice, and on the other hand, the employer learns about the problems the educator faces in developing an effective program. A well-conducted program of cooperative work requires some degree of follow-up of students when they are working. If department heads and instructors are involved in this follow-up, they are given an opportunity to meet with employers and to observe the operations in which their students are directly engaged.

During the period when students are on cooperative work assignment, they have an opportunity to decide whether or not they want to continue to work for the same employer after graduation. The employer also has an opportunity to observe the job performance of prospective employees over a period of time prior to making an offer of full-time employment upon graduation. One major employer that is involved in a cooperative work program has found the turn-over rate among former students who had their cooperative experience with the company is less than half of that among graduates of colleges that did not have a cooperative work program.

In spite of scholarships and loan funds, a large number of high-school graduates do not have funds to support themselves in college. Although earning money is not an objective of cooperative work, the fact is it does provide financial help, thus making education possible for people who might not otherwise have gone to college.

Everyone concerned with education is keenly aware of the increasing difficulty in obtaining sufficient funds to finance educational programs. Some colleges that have introduced co-op work programs operate on a four-quarter plan. Under this plan a substantial number of students are away from the college at all times with the result that the college can enroll approximately one third more students in these programs without any expansion

of facilities. For example, a college with facilities that can accommodate 750 full-time students can actually enroll a thousand students because during each quarter approximately 250 students will be on cooperative work assignments. Employers also benefit from this arrangement. The number of students they employ will remain constant the year around. This makes possible careful planning of the activities they will be engaged in.

Under a four quarter system, some faculty members will have to teach for four quarters. Because of attrition, however, the smallest number of students will be on campus during the summer quarter so that it will always be possible to release some faculty members who wish to continue their professional development or just relax.

Organizing The Program

The biggest problem a college faces in introducing a cooperative work program is to persuade employers that they are making an investment in the future and that over a period of time there will be considerable gain for them. The tendency is for the employer to use students to fill short-term manpower needs and to drop the program when there is a reduction in the volume of work that is available. Unless employers are willing to take responsibility for the continuous operation of a cooperative work program, it cannot possibly succeed. When an attempt is being made to establish this type of program, it is absolutely necessary that the college obtain a policy decision at the highest possible level of management in the cooperating institution. Within the college the best person to obtain this decision is the chief administrator. It is important that he plan to take an active part in getting the cooperative work program started.

If a cooperative work program is to be successful in achieving its objectives, the administrator must be prepared to provide adequate staff and financial support. Usually this means that he will have to create an office of cooperative placement and staff it with competent people whose sole responsibility is to coordinate the program. Since the person in charge of the office will often have to meet with the chief executive officers within the cooperating employers' institutions, he should be a person of sufficient stature to represent the college well.

Before being sent on a cooperative work assignment, students should be exposed to an orientation program designed to prepare them for a world of work. The completion of a satisfactory work assignment should also be made a requirement for graduation. By doing these things, students are usually persuaded to enter into their work experience in a serious frame of mind.

While the student is working, the college should maintain contact with him and his immediate supervisor so that if problems develop they can be dealt with promptly.

The definition of cooperative work experience included at the beginning of this chapter describes the essential elements that must be part of any good cooperative work program. If they are not included in the program, the results that will be produced will be directly opposite from that which is desired. The administrator should, therefore, provide some degree of supervision for the program and, after it has been in operation for a while, seek the opinions of employers and students in order to determine whether the program is functioning in the way it should.

One of the complaints of students involved in a cooperative work program is that they lose the habit of study during their cooperative work period. Consideration might, therefore, be given to development of a plan for the use of the time that is available during this period. A variety of possibilities exist for the use of this time. One college requires students to accept carefully planned assignments that help them to make up deficiencies in their requirements for graduation or to prepare them for academic work they will be involved in when they return to the campus.

8. Attracting Sufficient Students To The Program To Make It Economically Viable

Most two-year colleges operate under a financial support formula that practically requires that similar programs of study offered by the college be operated with no more than a share of the total operating budget that the number of students registered in each program entitles it to. Usually, an exception has to be made during the period when a new program is in the process of development. Every effort must be made, however, to publicize the program, and to register enough students so that within three years of the time when it is started it will be economically viable.

One of the best ways to publicize a new technology program and at the same time to obtain an estimate of the number of high-school graduates who will register in it is to conduct a survey among high school students in the immediate area served by the college. Most high school principals and counselors are quite willing to work with a college in this kind of effort because they are interested in new programs that will serve their students. Within the college, the Admission's Office should be responsible for conducting the survey and analyzing the data obtained by it.

A closed-type questionnaire is the best type to elicit the information that is needed. It should be simple in design with not more than twenty questions, all of which can be answered without difficulty. Where data processing equipment is available, it should be used for data analysis. At the end of this chapter is an example of the kind of survey form that might be used.

The number of high school students included in the survey should be as large as possible. The students should be in the tenth and eleventh year rather than in the twelfth year because generally, the latter group will already have made a commitment to a career.

Before the survey is made, representatives from the college should meet with high school guidance counselors to explain the nature of the new program and to give them an opportunity to ask questions about it. Probably the best kind of meeting is a dinner meeting held on the campus of the college. If this is done, students in the high schools may then be adequately informed about the new technology program and the employment opportunities that will be available to graduates.

Care must be exercised in evaluating the results of the survey. Experience in using the survey method to determine the number

of students who will register in a new program has shown that the number of registrants is likely to be less than half of those who indicate an initial interest. An opportunity to obtain entry into a field related to environmental control will probably have a considerable emotional appeal to a great many young people. The number indicating an interest in registering in this type of program may be even greater than would normally be the case.

There are many other ways to publicize programs in order to attract students. As soon as a firm decision has been made to offer the program, an attractive brochure should be prepared which contains a description of the curriculum, career opportunities related to the program, and information about registration. Copies of the brochure should be widely distributed well in advance of registration time.

Following the preparation of the brochure a more detailed description of the program should be prepared for the next printing of the college catalogue.

Actions taken by the controlling board of the college and by the advisory committee can provide excellent opportunities for publicity in the various news media.

Finally, an active campaign should be mounted to insure that speakers from the college have opportunities to appear at meetings of P.T.A. organizations, service clubs, professional organizations with interests close to the technology, and groups of high school teachers who teach mathematics and science subjects and who might be expected to prepare students to enter the program. Members of this latter group are often extremely effective in identifying students in their classes who, for a variety of reasons, might profit from a technology program, and counseling them into it.

If the program is to become known among the people the college wishes to interest, nothing should be taken for granted. Colleges that are well established and well known have to make a considerable publicity effort when they wish to attract students into a new program.

Sample Survey

TO: Area High School Students

Our college is planning the introduction of a new technology program in the field of environmental control. We would, therefore, like to know how much interest there might be in such a program among young people in the area we serve.

No doubt you are aware that both government and private agencies are becoming increasingly active in attempting to reduce

the level of pollution in our air and water, and to improve the quality of the physical world. To carry out the programs that are being developed, a great many people with adequate training will have to be employed.

The program our college may introduce starting approximately a year from now is designed to give high-school graduates two years of college-level training in order to prepare them for careers in an area of environmental control technology that should be rewarding in many ways.

We would appreciate it if you would provide us with some important information about yourself and your possible interest in the program by answering the questions which follow on the card that has been provided.

Environmental Control Technology Survey

Please use the pencils provided, and fill in the space on the card that corresponds to the most correct answer pertaining to you.

1. What subject areas are you most interested in?
   - A. English
   - B. Mathematics
   - C. History
   - D. Science
   - E. Foreign Language
   - F. Home Economics
   - G. Business
   - H. Industrial Arts

2. What is your high school average?
   - A. 90% or higher
   - B. 85 – 89
   - C. 80 – 84
   - D. 75 – 79
   - E. Below 75

3. In what year will you graduate?
   - A. 197_

4. When you have completed high school, will you have completed one year of biology?
   - A. Yes
   - B. No

5. When you have completed high school, will you have completed one year of chemistry?

   A. Yes
   B. No

6. When you have completed high school, will you have completed one year of physics?

   A. Yes
   B. No

7. When you have completed high school, will you have completed one year of earth science?

   A. Yes
   B. No

8. How many years of college entrance mathematics will you have completed by graduation?

   A. 1
   B. 2
   C. 3
   D. 3 1/2
   E. 4 or more

9. After you graduate from high school, are you planning to:

   A. Enter military service
   B. Go to work
   C. Go to vocational school
   D. Attend a two-year college
   E. Attend a four-year college

10. How concerned are you about your physical environment?

    A. Not concerned
    B. Quite concerned
    C. Very concerned
    D. Extremely concerned

11. If a program were offered at our college to prepare students for a career in Environmental Control Technology, would you consider enrollment?

    A. Possibly
    B. Definitely
    C. I am uncertain

D. Absolutely not
E. I feel I need more information

12. Would you consider taking courses in high school to prepare you for such programs?

A. Yes
B. No

9. Student Personnel Services

Counseling Services

The personal concerns of students registered in an environmental control technology program can be and are often just as important to them as their academic concerns. If these personal concerns are not dealt with, students will be unable to succeed in their academic work. The college administrator must provide an adequate program of student personnel services designed to meet the personal needs of students.

To initiate and carry on a program of student personnel services, the chief administrator will usually employ a Dean of Students who will report directly to him. The Dean of Students should have the responsibility of supervising the complete student personnel service's program including counseling; financial and health services; housing, if necessary; registration and records, and student activities.

Professional counselors must be a part of the staff of the Dean of Students and be fully involved in establishing and maintaining a comprehensive counseling program. A good counseling program should involve itself in three major concerns of students; they are the educational, the personal or psychological, and the vocational.

In helping students to deal with educational problems, the counselor may find himself involved in doing everything from scheduling developmental or remedial courses, to assisting students with problems that arise from their regular academic schedule or even changing the student's entire program of study because of a decision by the student to change his ultimate objective.

If a student decides to drop out of a college, a counselor should do all he can to determine the reason for this decision and try to help him make the adjustment he will have to make. Later, if the drop-out applies for re-admission, the counselor should be on hand to advise him regarding the program he could get the greatest benefit from.

A great many college students experience personal problems that require the help of a trained counselor for their solution. These problems can range from very simple to serious psychic ones. Most counselors are trained to deal with normal students who need help with fairly simple problems, and they can usually provide this help. When the problem is complex, however, the

student should be referred to an agency which is better qualified than the college to deal with such problems.

The vocational counseling function is probably the most important part of a good counseling program. Here the counselor will be heavily involved in the career-decision making process of the student. At least sixty per cent of the counselor's time will be taken up in performing this function. The counselor will assist the student in assessing his interests, aptitudes, abilities, (both strengths and weaknesses), personality and achievements. The counselor will use test scores, high school grades, information about the student's avocation, and evaluation by former teachers, counselors, etc. that are found in the student's record. If he feels more test data is needed, he will administer appropriate test instruments which include aptitude and achievement tests, interest inventories, value scales, and personality tests. The purpose is to provide the student with more information about himself so that he can make the best possible career-decision. In most cases, it will help stabilize the student's interest in his selected program or assist him in finding a program at the college where he will be successful, happy and well-motivated toward his goal.

If the counselor is to be seriously involved in assisting the student in the process of career-decision making, it is imperative that he keep alert to the specifics of each career field. He must visit industry and businesses frequently, and observe just what is involved in performing the tasks of a particular job. He must meet not only personnel managers but foremen, technicians and department managers and supervisors. The more he learns and observes, the more effective his counseling will be. He can very often work hand in hand with the Placement Office of the college and become a partner in visiting businesses, industries, and community agencies, which employ graduates. He must also keep alert to manpower needs, employment trends and the overall status of the economy.

In addition to visits to industries and businesses, the counselor can keep up to date by making use of such aids as the manpower reports of the state and federal governments and local manpower reports of the employment services. The "Occupational Outlook Handbook" of the United States Department of Labor is also a very valuable tool to the counselor. To assist in the selection of careers and description and classification of jobs, *The Dictionary of Occupational Titles,* can be a very valuable reference. There are many other ways the counselor can keep abreast of what is happening in the industries served by the college. In addition to knowing the salaries that may be earned, he must know a great deal about hours worked, chances for promotion, fringe benefits, education and training needed, and, most important, opportunities for the

growth and development of the student. He must in essence know the complete life-style associated with the job or career.

One of the advantages a professional counselor has over the teaching faculty is that a student will come to him with more confidence knowing that the facts he reveals about himself will not in any way influence his grades or his status in the college. A counseling center is, or should be, neutral territory where all information obtained through the counseling process is kept confidential.

Faculty as Advisors

In addition to a good professional counseling service, a college should have a strong faculty-advisement system. The faculty advisor should be a person in the student's academic department to whom he may turn with a quick question or an academic problem needing the expertise of someone in the technical field. Very often the student will need advice concerning the selection of courses when options or electives are available. The faculty advisor will know the curriculum in detail, and is usually the best one to assist in a situation of this kind. The faculty advisor will also assist the student in a periodic evaluation of his academic progress. As a result of a strong faculty advisement system the student will come in contact with at least one member of the faculty outside of the classroom. Very often this person will serve as a role model to the student. This can have an important effect on the student and should not be overlooked for its value. The relationship between the student and the faculty advisor can be a viable means of communication between the total faculty and all the students, something that is becoming increasingly important.

A faculty advisement plan should be organized on a departmental basis and supervised by the department heads. In most cases, the faculty will be required to maintain a schedule of office hours which the students should be made aware of. Experience has shown that twenty to twenty-five students is about the maximum number to whom a faculty member can pay careful attention. The professional counselors should assist with in-service programs to train faculty advisors and be ready to receive student referrals from them when they are confronted with a problem which is beyond their depth. It must be emphasized that faculty advisors should not become involved with in-depth counseling. This activity should be reserved for professional counselors. In summary, it can be said that a good professional counseling service and a strong faculty-advisement system will definitely contribute to the mission of the two-year college.

Health Service

Though colleges should not assume a major responsibility for student health, some provision should be made for emergency care and health counseling. The college should make clear through a statement in its catalog that medical care is the prime responsibility of the student's family. With health problems increasing among college age youth – witness the statistics showing an alarming increase in the spread of V.D. and the use of drugs, – the presence of some form of on-campus health service is an absolute necessity.

In most colleges the best way to provide health counseling and emergency care is through the employment of a college nurse. If she has the right kind of personality and can gain the confidence of the students, they will seek her help for the solution of a range of problems that they will not take to anyone else. She will often be aware of conditions that may affect the personal lives and the academic work of students, and can alert those people who can provide help before students are in serious trouble.

Student Records

The maintenance of adequate records is an absolutely essential service that the college must provide for students. These records should include a complete record of a student's academic work at the college and a summary of his previous academic work. They should also include information that might have value for counseling purposes, and in which a prospective employer might be interested. This non-academic information might relate to extra-curricular activities, health, results of tests, and employment experience.

Students are entitled to make reasonable requests that copies of their academic record be sent to prospective employers or other educational institutions they may be transferring to.

Most government supported colleges are required by law to maintain accurate academic records for a considerable period of time. Failure to do so may have legal implications.

Student Activities

Most colleges now feel some degree of responsibility to provide opportunities for the personal and social development of students through a program of student activities. The key element in such a program is a student government whose members have been

elected by the student body. With the help of a person on the staff of the Dean of Students they can explore students' interests and encourage the organization of groups based on those interests.

To provide financial support for a program of student activities, students usually levy a fee which must be paid by all students. There has been a legal dispute over the question of whether or not the college could act as a collecting agent, and require all students to pay a student activity fee. Recently, the highest court in one State has ruled that if the majority of students in a college vote in favor of a student activity fee that shall be collected from all students, then the college has the authority to act on the basis of this decision. The decisions regarding the use of this money must remain in the hands of the students through their elected representatives.

If students in a two-year college are provided the help they need in organizing their government and activity groups they have an opportunity to gain leadership experience and to mature at a much earlier time than they would if they attended a four-year college. In most two-year colleges students are elected to office not later than the end of their freshmen year. In their second year in college, they are, therefore, making serious decisions about the use of fairly large sums of money and taking actions that will affect the welfare of their fellow students. This is not usually the case in a four-year college.

It is in this area of student activities that students and faculty have an opportunity to come together in a way that is not possible in a strictly academic program. Many activities, particularly those of a cultural nature, will require joint planning by faculty members and students. Under these circumstances the quality of communication between faculty and students is bound to improve.

Preparatory And Financial Assistance Programs For Under-Qualified But Able Students

It is generally accepted that one of the missions of the two-year college is to identify high school graduates who have not had a good high school experience in terms of the grades they have been able to earn but who have given some indication of potential ability. Such students usually come from low income families and, if they went to college, would be first generation college students. If the college has a policy of trying to identify and recruit such students it should also have a program for helping them to make up deficiencies in their high school work and in many cases provide them with financial assistance.

A number of colleges have developed programs for assisting able students who have academic deficiencies either as a result of not taking courses that would prepare them for college, or because they have not performed well in course work that the college requires for admission to its technical programs.

One of these programs is called either "Student Development" or "Opportunity" or "Pretechnical". Students in this program attend college for three years rather than two. During the first year they do academic work that is intended to prepare them for admission to a degree program. This work is usually designed to strengthen their study skills, to improve their reading capability and to make it possible for them to make up deficiencies in mathematics and the basic sciences they failed to study in high school as preparation for entry into a technician program.

In dealing with students who enter a pre-technical program the fact must be kept in mind that the probable reason they have failed to prepare themselves for direct entry into a technology program is that they have not been motivated to do so. It is, therefore, necessary to do everything possible to develop their interest and desire to acquire the knowledge and skills a technician must have in order to perform successfully in his chosen field. One way of doing this is to provide opportunities early in the program for laboratory experiences that are meaningful and challenging within the limits of an individual student's ability, and, to the extent it is possible, course material should be directly related to the technology the student is interested in.

For those persons interested in obtaining information about this type of program a U.S. Office of Education document entitled *"Pretechnical Post High School Programs"*, Superintendent of Documents, Catalog No. FS 5.280:80049 is available.

Other colleges have been successful in making it possible for students to make up deficiencies and enter a two-year program with a reasonable chance of success by admitting them to specially designed summer and evening programs. These are really pretechnology programs with different time schedules. They are particularly suited for students who cannot afford three full-time years of college study and for colleges that are not able to expand full-time pretechnical programs because of lack of space.

A third plan consists of admitting a group of students who have completed with minimal success the high school course work the college requires for admission. They take a reduced load of not more than three or four courses selected from the curriculum. Usually these courses are in the area of mathematics and science. These students are given more assistance than regular students usually receive through provision for supervised study. If they

perform successfully, they are given full credit for their work and allowed to matriculate. In most cases they have to attend classes for more than the four semesters or six quarters that most students attend but not necessarily three years.

These preparatory programs have value because they challenge students and provide them with an opportunity to obtain further education in such a way that their chances of failure are considerably reduced. They also make possible the recruitment of students into technology programs who would not otherwise be qualified. This is extremely important because not nearly enough students are presently graduating from technology programs to meet the national needs.

One of the important criteria by which the success of a technology program can be measured is the number of graduates compared with the number of students that entered the program. If one of these programs serves substantially to reduce attrition from a technology program a considerable amount of effort and expense can be justified in introducing it.

Wherever a preparatory program is introduced into a college, it should be evaluated in terms of its effectiveness and, where necessary, modified in order to bring about improvement.

None of these programs can be successful without counseling based on a careful estimate of the student's actual ability. Both his counselors and his teachers also have to appreciate the fact that his high-school experience may have caused him to believe that he cannot do academic work successfully. Additionally, the conditions in his home may not be conducive to success in college.

Many of the students registered in such programs will need financial assistance. Unfortunately, because they are not sure of their ability to succeed academically, they are often reluctant to borrow money to finance their education. During the first few months and until they have gained confidence in themselves it may be necessary to provide financial aid in the form of outright grants or scholarships. These grants should be sufficiently large so that these students will not find it necessary to do very much part-time work to support themselves. In fact, they should be definitely discouraged from doing anything that would adversely affect their academic performance. Obtaining funds to assist these students should be part of the total program for providing them with an opportunity to obtain an education at the two-year college level.

10. Placement and Follow Up of Graduates (Evaluation)

Organizing the Placement Function

An environmental control technology program cannot justify its existence unless the graduates of the program can find the kind of employment for which they have been trained. Those persons responsible for placement carry a great deal of responsibility for the success of the program. Unfortunately, many employers do not clearly understand the role of a technician in the industries they operate, so that even in a situation where a college conducts such well established programs as mechanical and electrical technology, a considerable effort has to be made to inform employers about the capabilities of graduates in order that they can be placed in truly technician jobs. The placement of graduates of a new environmental control technology program will, therefore, require a very considerable effort, particularly during the first few years the program is in existence.

In some colleges, the responsibility for placement is assigned to the department heads. The arguments in favor of this practice are: (1) the department head is thoroughly familiar with the objectives of the curriculum, and is therefore able to advise prospective employers regarding the types of positions students are qualified to fill; (2) he knows the students and the extent of their abilities; and (3) by maintaining contact with employers, the department head will be made aware of changes in employers' needs. All of these arguments are valid.

Unfortunately, placement is a very time consuming operation. In fact, it takes so much time that if a department head is responsible for it, the instructional program may suffer. In colleges which offer a number of technology programs, this arrangement may result in several department heads canvassing the same employer and in many other ways duplicating each other's effort. This means waste both for the employer and the college.

Wherever a college can justify a Placement Office on the basis of a large enough enrollment and the existence of the number of programs it offers, it should establish one and make a director of placement responsible for its operation. This does not mean that department heads will not have a role to play in the placement function. On the contrary, if the director of placement is to operate effectively, he will have to work closely with department heads in a number of ways.

A director of placement should be a mature person who has both counseling and industrial experience. Before starting his placement effort he must become thoroughly familiar with the objectives of the technology program through an examination of the study that identified the need for the program, discussions with the department head, and attendance at meetings with the advisory committee.

A placement director who is content to work exclusively with personnel managers will find that they are usually not informed about the long-range plans of their organization, and that their work consists largely of filling requisitions made by other people. His initial contacts with industry must be made at the highest level of management possible in order to inform management about the kind of graduate the program is producing, and to obtain an accurate picture of the placement possibilities with each employing organization. Beyond this he may have to make contact with practitioners at the professional level for the purpose of observing operations graduates may be involved in and informing the professionals about the extent to which graduates may be of help to them. In this way he will create a demand for graduates that might otherwise not develop.

In all this activity, the members of the advisory committee can provide a tremendous amount of help.

Earlier it was said that one of the criteria by which the success of a technology program can be measured is the number of graduates compared with the number of students that entered the program. Another is the success of graduates in their employment situation.

A part of the responsibility of the director of placement must be to maintain contact with graduates and their employers in order to obtain information about the kind of work graduates are doing and the extent to which they are applying the knowledge and skill they acquired while in college. It is not enough for the administrator to know what percentage of the graduates are placed on jobs. He must know the nature of the work graduates are doing and the success or failure they are experiencing in doing this work. If he finds that they are employed under the same conditions as recent high school graduates, he will want to find out why this is.

This initial study of graduate placement should be followed by another one two years later to determine the progress graduates have made. If it develops that most of the graduates can only obtain blind-alley employment with little or no opportunity for advancement, the administrator should question whether two years of college can be justified.

Within a technology department the teaching staff will need to

have information about the success or failure of graduates in order to determine the need for modifications in the instructional program.

Most educators have as a major objective the maintenance of quality in the programs they are responsible for. In the case of technology programs, the only certain way to determine that quality is being maintained is through a careful follow up of graduates after they leave college.

Success in the placement of students in satisfactory employment will make the administrator's task much easier than it might otherwise be. Not only will public support for the program be easier to obtain, he will also find that he has less difficulty attracting good students and faculty.

11. Potential of the Program to Provide Short, Specialized Courses for Employed Persons to Enter the Field as Skilled Workers or to Upgrade their Skills and Knowledge to Technician Level

One of the characteristics of modern society is the rapid pace of social and technological change brought on by the application of new knowledge. The challenge of change to the individual in our society is to continue to be contemporary both as a citizen and as a productive worker. No longer can a person feel at any time that he has acquired enough education to last him the rest of his life.

This is particularly true if he is engaged in a technical occupation in the field of environmental control, which is new and developing rapidly. It is probable that he will have to make a considerable effort during all his working days to keep abreast of these developments.

The two-year colleges, located as most of them are in centers of industry and commerce, are well situated to provide courses for those people who, because they lack adequate training, are employed in tasks that do not challenge them and are well below the level of their potential ability to perform. Many of these people have acquired family responsibilities and are not able to give up their work to go to college full time. For them one solution to the problem of obtaining further education is part-time evening courses. There is evidence that when a two-year college offers evening courses tailored to meet specific needs, the demand for such courses will be very great. Many two-year colleges have twice as many part-time students enrolled in evening programs as they have full-time students enrolled in the day.

People who wish to enroll in technical courses in a two-year college can usually be placed in one of two categories: those employed in an industry who want to increase their knowledge and skills to such an extent that they can work as technicians, and those who would like to acquire enough skill to obtain an entry job. The needs of both groups can and should be met by the two-year college through evening courses.

A few years ago a two-year college, faced with the task of

helping a community that had been for many years a center for the textile industry make the transition from being a textile center to a center for light metal working and electronics industries, found that several hundred high school graduates were under-employed in the work they were doing. These people, when they were given an opportunity to improve themselves, became excellent students well able to develop the skills needed by the new industry. Incidentally, this college learned that the best way to solve an unemployment problem through training is to upgrade people who are already employed, and in this way make room for unemployed persons with limited ability at the entry positions rather than to try to train unemployed persons who have no related job experience.

If an environmental control technology curriculum is to serve as the basis for the organization of short courses for those who wish to obtain an entry job or those already employed who wish to increase their knowledge of the field, it must have two important characteristics: (1) It must be so constructed that it can be revised and updated to reflect the latest developments which have occurred within the field. (2) It must be sufficiently flexible to make possible the organization of a sequence of courses that can be taken over a limited period of time for the purpose of providing students with the skills they need to obtain entry jobs.

A two-year curriculum in Water and Waste Water Technology might prepare a graduate for employment in many areas of sanitation, public health, and physical facilities operation. A person who has the limited objective of becoming a waste-water treatment plant operator should be able to take only those courses in the curriculum that are directly related to the attainment of this objective. They would be taken in a logical order and upon successful completion of them he might be awarded a certificate indicating this fact.

Short courses must be designed with just as much care as is exercised in planning the two-year curriculum. The curriculum advisory committee should be consulted along with others competent to give advice regarding the course content.

Potential registrants for these courses should be urged to obtain the help of a professional counselor who can, through personal interviews and testing, help them to develop both short and long-range educational goals that are realistic. Understanding and accepting these goals and relating them to his own needs, desires, and interests will greatly increase the student's ability successfully to attain these goals.

Within the recent past, major employers have signed contracts with labor unions which include agreements that the employers

will provide a broad range of training opportunities for hourly and non-exempt salaried employees. The expectation is that the two-year colleges will accept responsibility for designing and offering a substantial part of this program.

Company literature describes the program as an individual development program, which means that it will be tailored to meet the specific needs of individuals. The literature also states that while the potential benefits are great for both the employee and the company, a poor program could result in lower employee morale and productivity, increased employee grievances, and even possibly a strike.

If this new development in Company – Union relationship represents a trend, and there is good reason to believe it does, two-year colleges can expect an increasing pressure to expand and improve the quality of specialized courses designed to upgrade the skills and knowledge of employed persons.

A successful program of this kind can only succeed if the administrator has a definite commitment to the program. He must staff the program with people who know how to establish and maintain contact with people in those organizations that are likely to be familiar with community needs for the kind of service the college can provide. These people must also be able to draw on the total resources of the college for the purpose of developing courses designed to satisfy these needs. Approval of the selection of instructors and the general supervision of instruction must be the responsibility of full-time department heads. Counseling services, the library, and other services directly related to the instructional program of the college must be just as available to employed part-time students and instructors as they are to full-time students. *In other words, the administrator must understand that he is responsible for the administration of an educational program that may start in the morning and continue into late evening and that the same standards of quality must be maintained throughout the program.*

If this happens, the fact will soon become known in the community where the college is located, and then both individuals and institutions will turn to the college for help when there appears to be a need for short, specialized courses.

12. Example of Factors Considered and Actions Taken to Initiate a Water Conservation and Pollution Control Technology Program

Howard E. Boudreau, President
Fayetteville Technical Institute
Fayetteville, North Carolina

The increasing trend toward urbanization of the nation's population; the increasing problem of water shortage in various parts of the country; the seriousness of the pollution of our rivers, lakes and streams; the sophisticated and complicated systems for water purification and distribution; and the increasing number and complexity of sewage handling and disposal systems, all point to a growing need for personnel who are better prepared than in the past to do much of the work of researching, operating, and controlling public, private, and industrial sewage disposal systems and related occupations.

The impact of technological development and change in the entire field of water and waste water treatment has been so great that there is a growing need for support personnel at the technician level with qualifications sufficient to assist the researchers and plant operators who are working in this field.

This was some of the thinking that in 1964 prompted Fayetteville Technical Institute to explore the feasibility of training people in this area. Since that time, the whole area of our environmental control opened up a tremendous category of job opportunities for the technician in this field. The environmental engineering program's initial thrust came from members of our engineering technology faculty whose previous experience was in the field of water and waste water treatment. As we began to discuss the possibility of developing a two-year associate degree program in this area, it was determined early that we needed to form a Statewide advisory committee made up of people who were directly involved with water and waste water treatment and people who were involved with the State stream and sanitation control.

The main function of the State Advisory Committee was:

1. To determine the need for technicians in the field of environmental engineering technology.
2. To help determine what courses should be placed in the curriculum.
3. To help determine the facilities which should be included in the laboratories.

A work plan was drawn up to be used as a blueprint in the development of a curriculum guide to educate this environmental engineering technician. At the time F.T.I. was developing this curriculum, a check of other schools and technical institutes across the nation revealed the surprising fact that the only programs offered in the environmental field were either in the four-year colleges and universities or in short extension programs. A training void definitely existed at the two-year technician level.

Some of the factors which needed to be considered in developing this curriculum were:

1. Document the need for such technicians and justify the rationale for assuming that such technicians could be educated in a two-year post-secondary program in our Community College System.
2. Define in detail what these technicians would be able to do. This should include the whole cluster of work possibilities from assisting in the research and development, plant design, plant operation, plant control and sales and services of water and waste water treatment equipment.
3. Define the level of scholastic attainment required for students entering this program.
4. Define the depth and kinds of mechanical portions — mathematics, physics, biological, chemical, and related courses required, keeping in mind their sequence with provisions that about half the total curriculum be in the field of science and related courses strongly oriented toward laboratory learning and experience.
5. Diagram and layout laboratory equipment showing arrangement, allocation of space, the number of students the laboratory is to serve and what other existing laboratories could be used in connection with this curriculum.

To gather specific information regarding the laboratory and equipment needed for this type of curriculum, a trip was planned to the Robert A. Taft Engineering Center of the Public Health Service in Cincinnati, Ohio.

We received a great deal of encouragement and cooperation from the personnel at this center. They concurred with our

thinking that a great need for this technician did exist and there were virtually no institutions providing a two-year curriculum designed specifically for the technician.

Upon completion of the work done by the Advisory Committee, the members of our faculty and staff and outside resources people, our institution began to put together a curriculum designed to train technicians to work in the area of Sanitary Engineering and Public Health. The student would receive related courses in mathematics, science, drafting, and surveying in addition to specialized technical courses such as water and waste water treatment, sanitation control systems, and plant and equipment maintenance. Provisions were made to construct a water hydraulics laboratory especially designed to train these students to do the work industry and governmental agencies would be seeking from this new technician.

The entire curriculum was designed in such a manner that it could be worked around a core program and adapted to our local situation. The curriculum was approved by the State Advisory Committee and was sent to the North Carolina Department of Community Colleges for their approval. The North Carolina Department of Community Colleges and the North Carolina State Board of Education approved the curriculum in June of 1964 and the new curriculum entitled "Sanitary Engineering Technology" was put into operation in the fall of 1964.

The next big problem was the recruitment of qualified candidates to enter the curriculum. Up until this time very little interest had been in evidence relative to our environment, pollution, ecology, etc. At the very outset in our recruiting plan, we became aware that the name itself, sanitary engineer, could mean many things. It could mean working as a janitor or a custodian, or it could mean working in the water and waste water treatment plants, which was our purpose. However, we did manage to recruit 20 students to begin our program.

Another problem which we faced at this time was securing employment for the students upon graduation. Were municipalities and industry ready to accept a two-year graduate in the field of Environmental Engineering and were they prepared to pay sufficient salaries to compensate for their education? In our visits across the United States, we discovered that many municipalities still clung to the belief that a chemist or a college graduate was needed to perform the biological tests on water and waste water, and that they would not hire a two-year graduate to operate and maintain the water and waste water plants. Most of these problems were solved when the Federal and State governments began to express a desire to clean up the environment in our streams, lakes, and other water supplies.

The graduates of our first class had no problems in securing employment in a variety of positions such as public health engineering aide, sanitarian engineering aide, treatment plant operators, stream sanitation technicians, etc.

With the implementation of this new curriculum in Environmental Engineering Technology, we were confident that we were and would be preparing people for an occupation where an acute shortage of trained manpower had developed. The market today for the graduate of a two-year program in the field of Environmental Engineering is wide open and the future of these technicians is unlimited.

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13. Selected List of Scientific and Technical Societies and Associations Which are Pertinent to or Which Support Various Environmental and Ecological Technologies

AIR POLLUTION CONTROL ASSOCIATION

4400 5th Avenue
Pittsburgh, Pennsylvania 15213

Purpose:

To improve air sanitation and foster control of atmospheric pollution affecting health and/or causing damage to property, nuisance to the public, and waste of natural resources; to encourage public acceptance of the necessity for atmospheric pollution prevention and assist governmental units toward a solution of this problem; to encourage the development and adoption of apparatus, equipment, and operating procedures that will economically prevent pollution of the atmosphere; to promote research in the solution of problems embracing all sources of atmospheric pollution; to prepare and distribute literature and publications pertaining to the problems involved in providing cleaner air; and to maintain a library and information service of professional papers, technical articles and publications, and descriptive material pertaining to cause, effect, and remedy of processes involving atmospheric pollution.

Publications:

Journal, bimonthly; *APCA Abstracts*, monthly. Various directories and technical journals annually.

AMERICAN CHEMICAL SOCIETY

1155 Sixteenth Street N.W.
Washington, D.C. 20036

Publications:

Environmental Science and Technology, monthly; *Industrial and Engineering Chemistry*, monthly; *Journal of Agriculture and Food Chemistry*, bimonthly; *Journal of The American Chemical Society*, semimonthly.

Purpose:

To encourage in the broadest and most liberal manner the advancement of chemistry in all of its branches; the promotion of research in chemical science and industry; the improvement of the qualifications and usefulness of chemists; the increase and diffusion of chemical knowledge; and to promote scientific interests and inquiry.

AMERICAN FISHERIES SOCIETY

1404 New York Avenue, N.W.
Washington, D.C. 20005

Purpose:

To promote conservation, development, and wise utilization of fisheries, both recreational and commercial.

Publications:

Transaction, quarterly.

AMERICAN FORESTRY ASSOCIATION

919 17th Street N.W.
Washington, D.C. 20006

Purpose:

To promote the advancement of intelligent management and use of the country's forests and related resources of soil, water wildlife, and outdoor recreation.

Publications:

American Forests, monthly.

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION

14125 Prevost Street
Detroit, Michigan 48227

Purpose:

To increase the knowledge of industrial hygiene through interchange and dissemination of information; to promote the study and control of environmental factors affecting the health and well-being of industrial workers; to correlate such activities as are conducted by individuals and agencies throughout industrial, educational, and governmental groups; to bring together persons interested in the various phases of industrial hygiene.

Publications:

AIHA Journal, bimonthly; numerous other publications on air pollution, noise, respirators, and other pertinent subjects; periodical.

AMERICAN INSTITUTE OF ARCHITECTS

1735 New York Avenue N.W.
Washington, D.C. 20006

Purpose:

To organize and unite in fellowship the architects of the United States of America; to combine their efforts in order to promote the aesthetic, scientific, and practical efficiency of the profession; to advance the science and art of planning and building by advancing the standards of architectural education, training, and practice; to coordinate the building industry and the profession of architecture to insure the advancement of the living standards of our people through their improved environment; to make the profession of ever-increasing service to society.

Publications:

Journal, monthly; *Memo* (Newsletter), biweekly.

AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES

3900 Wisconsin Avenue, N.W.
Washington, D.C. 20016

Purpose:

To advance the biological, medical, and agricultural sciences and their applications to human welfare; to give assistance to societies, organizations, and individual biolo-

gists in matters of common concern which can be most effectively dealt with by united actions.

Publications:

Bio-Science, monthly; *Quarterly Review of Biology*.

AMERICAN INSTITUTE OF PARK EXECUTIVES, INC.

Ogleybay Park,
Wheeling, West Virginia 26003

Purpose:

To promote the gathering and dissemination of information concerning public parks, gardens, and other recreation grounds, facilities, and programs. to promote increase of such facilities and their greater utilization.

Publications:

Parks and Recreation, monthly; *Management Aids Bulletin*, monthly.

AMERICAN MEDICAL TECHNOLOGISTS, INC.

710 Higgins Road
Park Ridge, Illinois 60068

Purpose:

To elevate standards in the field of medical technology; to maintain constant education in the field for members by means of scientific seminars and conventions.

Publications:

Journal, bimonthly.

AMERICAN METEOROLOGICAL SOCIETY

45 Beacon Street
Boston, Mass. 02108

Purpose:

To promote the development and dissemination of knowledge of meteorology in all its phases and applications and the advancement of its professional ideals.

Publications:

Bulletin, monthly; *Journal of Applied Meteorology*, bimonthly; *Meteorological and Geoastrophysical Abstracts*, monthly; *Weatherwise*, bimonthly. *Journal of the Atmospheric Sciences*, bimonthly.

AMERICAN SANITARY ENGINEERING INTERSOCIETY BOARD

P.O. Box 9728
Washington, D.C. 20016

Purpose:

To improve the practice, elevate the standards, and advance the cause of sanitary engineering; to grant and issue to engineers, duly licensed by law to practice engineering, certificates of special knowledge in the various fields of sanitary engineering.

Publications:

Sanitary Engineering Education Directory; Qualifications for Accreditation of Advanced Degree Curricula in Sanitary Engineering.

AMERICAN SOCIETY OF LANDSCAPING ARCHITECTS, INC.

2000 K. Street N.W.
Washington, D.C. 20006

Purpose:

To advance education and skill in the art of landscape architecture as an instrument of service in the public welfare.

Publications:

Landscape Architecture, quarterly; *Landscape Architectural News Digest*, monthly.

AMERICAN SOCIETY OF MEDICAL TECHNOLOGISTS

Suite 25 Herman Professional Building
Houston, Texas 77025

Purpose:

To promote higher standards in clinical laboratory methods

and research, to elevate the status of those specializing in medical laboratory techniques; to create mutual understanding and cooperation between medical technologists and physician and all others who are employed in the interest of individual or public health.

Publications:

The American Journal of Medical Technology, bimonthly; *Newsletter*, bimonthly.

AMERICAN SOCIETY OF RADIOLOGIC TECHNOLOGISTS

537 South Main Street
Fond du Lac, Wis. 54935

Purpose:

To promote the science and art of radiography.

Publications:

Radiologic Technology, bimonthly.

AMERICAN SOCIETY OF SANITARY ENGINEERING

288 Standard Building
Cleveland, Ohio 44113

Purpose:

To engage in research in plumbing engineering, water supply, sewage disposal, and fixture design.

Publications:

Intermittent

AMERICAN WATER WORKS ASSOCIATION, INC.

2 Park Avenue
New York, New York 10016

Purpose:

To promote the advancement of knowledge of design, construction, operation, and management of water works.

Publications:

AWWA Journal, monthly.

CONFERENCE OF STATE SANITARY ENGINEERS

State Department of Health
84 Holland Avenue
Albany, New York 12208

Purpose:

To promote public health in all phases; to coordinate public health engineering activities of official State and territorial health organizations; to encourage interchange of experience among State sanitary engineers in official administrative positions; to make available to all such officials information and data which might assist them in fulfillment of their duties.

Publications:

Report of Proceedings, annual.

CONFERENCE OF STATE AND PROVINCIAL PUBLIC HEALTH LABORATORY DIRECTORS

P.O. Box C
University Station
Grand Forks, North Dak. 58202

Purpose:

To promote the development, improvement, and effectiveness of public health laboratory service; to coordinate public health laboratory activities; to stimulate the interchange of experience among directors of official public health laboratories; to develop and maintain adequate standards for the professional training of public health health laboratory personnel; to encourage constant effort toward the improvement and standardization of technical methods; to collect and make accessible to all persons in official administrative positions in public health laboratories such information and data as might be of assistance to them in the proper fulfillment of their duties.

Publications:

Public Health Laboratory, bimonthly.

ECOLOGICAL SOCIETY OF AMERICA

Oak Ridge National Laboratory
Radiation Ecology Division
Oak Ridge, Tenn. 37831

Purpose:

To promote the scientific study of organisms in relation to their environment, both as individuals and as members of populations and communities; and to facilitate the exchange of ideas among those interested in this area of study.

Publications:

Bulletin, quarterly; *Ecology,* quarterly; *Ecological Monographs,* quarterly.

INSTITUTE OF ENVIRONMENTAL SCIENCES

34 South Main Street
Mt. Prospect, Illinois 60057

Purpose:

To provide means whereby environmental sciences can be explained, discussed, and thus aid the technological advances of this hemisphere.

Publications:

Journal of Environmental Sciences, bimonthly; *Proceedings,* annually.

INSTITUTE OF SANITATION MANAGEMENT

55 West 42nd Street
New York, New York 10036

Purpose:

To maintain and improve the standards of industrial sanitation – including building maintenance; to promote industrial sanitation as a managed function in its application to work environment; to foster and engage in research and educational activities; to disseminate information pertaining to methods and costs.

Publications:

Annual Conference Highlights, annually; various technical bulletins, periodically.

NATIONAL ASSOCIATION OF SANITARIANS

University of Denver
Denve , Colorado 80203

Purpose:

To provide specific services in the field of environmental sanitation for official and voluntary agencies, and other people concerned; to uphold and increase standards of the sanitation profession; to search continually for truths, and disseminate findings; to strive for knowledge, and to be fully informed of developments in the field of public health; to cooperate fully with allied public health agencies.

Publications:

Journal of Environmental Health, bimonthly.

NATIONAL RIVERS AND HARBORS CONGRESS

1028 Connecticut Avenue N.W.
Washington, D.C. 20036

Purpose:

To collect and prepare all obtainable data regarding the improvement, development, and uses of the rivers, harbors, and waterways of the United States and other countries.

Publications:

The Monthly Reporter.

NATIONAL SANITATION FOUNDATION

School of Public Health
University of Michigan
Ann Arbor, Michigan 48106

Purpose:

To conduct research and educational programs in the field of environmental sanitation and health.

Publications:

Food Service Equipment, annual; *Plastics for Potable Water and Drain, Waste and Vent*, annual; *Swimming Pool Equipment*, annual.

NATURAL RESOURCES COUNCIL OF AMERICA

320 Bond Building
Washington, D.C. 20005

Purpose:

To advance attainment of sound natural resource management through an organization of major national and regional conservation and scientific societies by effecting cooperation among them to serve common needs in resource management.

Publications:

Legislative News Service, semi-monthly.

(THE) NATURE CONSERVANCY

2039 K. Street N.W.
Washington, D.C. 20006

Purpose:

To preserve wild nature, particularly to establish and protect nature preserves which will include an adequate series of natural areas of all types; to promote scientific, educational and inspirational use of such areas.

Publications:

The Nature Conservancy News, quarterly.

SOCIETY OF AMERICAN FORESTERS

Suite 300
1010 16th Street N.W.
Washington, D.C. 20036

Purpose:

To represent advance, and protect the interests and standards of the profession of forestry; to provide a medium for exchange of professional thought; and to promote the

science, practice, and standards of forestry at an accredited college or university.

Publications:

Journal of Forestry, monthly; *Forest Science*, quarterly.

SOIL CONSERVATION SOCIETY OF AMERICA, INC.

7515 N.E. Ankeny Road
Ankeny, Iowa 50021

Purpose:

To advance the science and art of good land use.

Publications:

Journals of Soil and Water Conservation, bimonthly.

WATER POLLUTION CONTROL FEDERATION

4435 Wisconsin Avenue
Washington, D.C. 20016

Purpose:

To promote the advancement of fundamental and practical knowledge of all aspects of water pollution control by dissemination of technical knowledge through publications of the organization, and by promotion of good public relationships and sound regulations aimed toward water pollution control.

Publications:

Journal, monthly; *Highlights*, monthly.

Also publishes other reports and educational material on problems involving industry and administrative health officials whose obligation is to enforce regulations.

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14. Bibliography

The amount of literature dealing with the subject of environmental control has increased so rapidly that it is impossible to list more than a small fraction of the titles that are available. The following bibliography lists only those materials that would have value for a college administrator who wishes to become familiar with policy issues in the area of environmental control. Also included is a selection of bibliographies through which literature dealing with the broad scope of the problem and the means of dealing with it may be identified.

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